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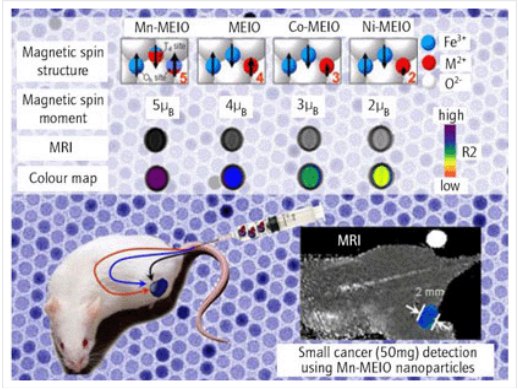
Dual-Mode Nanoparticles Image Tumors Using MRI and PET

Medical imaging represents one of the most used and useful procedures in the oncologist's diagnostic toolkit, even though each of the most useful techniques—magnetic resonance imaging (MRI), computerized tomography x-ray imaging (CT), and positron emission tomography (PET) scanning—has its own set of limitations. The companies that make imaging instruments have responded by developing so-called dual-modality machines that can simultaneously perform two different types of scans. Now two reports in the scientific literature show how nanotechnology researchers have responded by creating dual-modality contrast agents for future use with these next-generation imaging devices.

A new report focus on magnetic nanoparticles, which are proven MRI contrast agents and also contain the radioisotopes needed to perform PET images. Jinwoo Cheon, Ph.D., Yonsei University in Korea, and his colleagues published their paper in the journal Angewandte Chemie International Edition. Dr. Cheon is a member of the Center for Cancer Nanotechnology Excellence at Northwestern University.



Dr. Cheon's group first created a magnetic nanoparticle from manganese and iron and coated it with albumin, the most common protein in blood; this nanoparticle produces a very strong signal in an MRI. Next, the researchers added PET functionality by chemically attaching radioactive iodine to the albumin coating. They then showed the value of combining MRI and PET contrast agents in the same nanoparticle in a simple experiment that compared the spatial resolution—how small an object they could image accurately—and the sensitivity—how little they could see—of each modality when using the same dual-modality nanoparticle. The spatial resolution in the MRI was far greater than that measured in the PET image, and PET imaging was able to detect far less material.

In additional tests, the investigators used their dual-modality nanoparticle to image sentinel lymph nodes in mice. Imaging sentinel lymph nodes is an important diagnostic procedure used to check for metastasis. The investigators found that layering the MRI and PET scans, acquired simultaneously on top of each other, enabled them to unambiguously identify two different lymph nodes.

This work, which was supported by the National Cancer Institute Alliance for Nanotechnology Excellence, is detailed in a paper titled, "Dual-mode nanoparticle probes for high-performance magnetic resonance and fluorescence imaging of neuroblastoma," Angew. Chem. Int. Ed. 2008, 47(33), pp6259-6262. Jul. 9.